REMARKS/ARGUMENTS

The subject matter of claim 31 (i.e. repeating unit is PO-13) is indicated to be allowable. The remaining claims are amended to be of greatly reduced scope and additional testing to the earlier filed testing is filed herewith as detailed below.

With respect to the amendment of Claim 3, Formula (3) is supported by original Claim 4, and Formula (9) is supported by Formula (21) in original Claim 8.

The anticipation rejection of claims 1 and 11-14 is avoided by amendments to claim 1 as detailed below.

Claims 3-7, 9, 10, 15-17, 19-21, 23-25, and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takimoto et al. (US 5,331,182 A) in view of Tokito et al. (US 2003/0091862 A1).

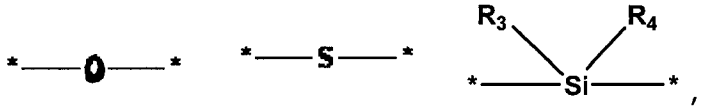
Claims 3, 4, 6, 7, 9, 10, 15-17, 19-21 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takimoto et al. (US 5,331,182 A) in view of IKEHIRA et al. (US 2002/0193532 A1).

Claim 3 was amended as outlined above.

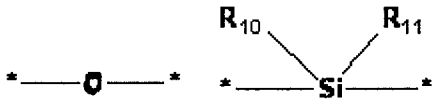
In amended claim 3:

(i) Ar_2 was limited to a phenylene group which may have a substituent or a biphenylene group which may have a substituent (see original claim for support),

(ii) L_2 was limited to



(iii) L_3 was limited to



(iv) X was limited to a group represented by Formula (3) or (9).

The Examiner states that "It would be obvious to one of ordinary skill in the art at the time of the invention to combine he hole transporting compounds and phosphorescent complexes pendent chains as taught by Tokito et al. with the polymer of Takimoto et al. One of ordinary skill in the art would reasonably expect such a combination to be suitable given both references disclose light-emitting polymers designed for use in similar electroluminescent devices. One of ordinary skill in the

art would be motivated by a desire to have very highly efficient phosphorescence."

When Organic EL element 2-1-7 employing Poly-13 having a carbazolyl group pendent to a polyphenylether chain (one of the polymers of the present Application) in the light emission layer is compared with Organic EL element 2-1-1 employing PVK (polyvinylcarbazole) having a carbazolyl group pendent to a polyvinyl chain (one of the polymers disclosed by Tokito et al.) in the light emission layer (Tables 5 and 7 in pages 106-107 of the present Application), it is clear that Poly-13 exhibits considerably higher "External quantum efficiency", longer "Emission Life" and lower "Driving voltage" than those of PVK.

Poly-13 is one of the simplest polymers of the present Application, in which a simple carbazolyl group is pendent to a polyphenylether chain having no substituent.

Accordingly, the comparison of poly-13 with PVK when used in a light emission layer enables a direct comparison of the property of a polyphenylether chain with that of a polyvinyl chain when both polymer chains have the same carbazolyl pendant.

It is clear from the above results that the polyphenylether having a carbazolyl pendant exhibits considerably higher "External quantum efficiency", longer "Emission Life" and lower "Driving voltage" than those of the polyvinyl chain having the same carbazolyl pendant.

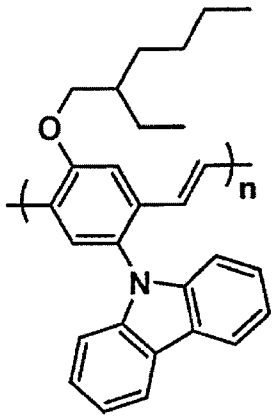
Such an unexpected superiority of the property of the polyphenyether chain compared to that of the polyvinyl chain, when both polymer chains have the same carbazolyl pendant, is not obvious over Takimoto et al. and Tokito et al.

On the other hand, in Tables 11 and 12 in the previously presented 1.132 declaration (submitted on November 24, 2009), Organic EL element 2-4-1 employing Poly-17 in the light emission layer is compared with Organic EL element 2-4-2 employing CzPPV in the light emission layer.

Here, polymer chains each having an iso-octoxy group as a substituent were compared because a polyphenylene vinylene chain having a carbazolyl pendant has very low solubilities in ordinary solvents.

It is clear from Tables 11 and 12 that Poly-17 exhibits a higher External quantum efficiency, a longer Emission life and a

lower Driving voltage compared with those of CzPPV (shown below). It should be noted that the External quantum efficiency of Poly-17 is notably higher than that of CzPPV. The result demonstrates the superiority of the polyphenylether chain compared to the polyphenylene vinylene chain when both polymer chains are attached with the same carbazolyl pendant.

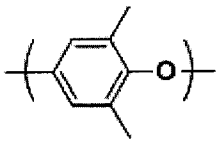


CzPPV

Such an unexpected superiority of the property of the polyphenyether chain compared to that of the polyphenylene vinylene chain, when both polymer chains have the same carbazolyl pendant, is not obvious over Takimoto et al. and Ikehira et al.

In Organic EL elements 2-1-26 and 2-1-27 in Table 5-continued-2 and Table 7-continued-2 in the 1.132 declaration submitted together with the present response, the properties of PO-1 and PO-21 when used in the light emission layer of an organic EL element are compared with the properties of PVK (Organic EL element 2-1-1 in Tables 5 and 7 of the Specification).

PO-1 (page 24 of the Specification) and PO-21 (the structure is shown below) are polymers having two phenyl groups and two methyl groups, respectively, while having no functional group pendant.



PO-21

As shown in Table 5-continued-2 and Table 7-continued-2 in the 1.132 declaration submitted with the present response, both of PO-1 and PO-21 exhibits higher External quantum efficiencies, longer Emission lives and lower Driving voltage than those of PVK.

It should be noted that, while both of PO-1 and PO-21 have no functional group pendant, these polymers exhibit almost comparable or more favorable properties than those of PVK having a carbazolyl pendant exhibiting a hole transporting function, when used in the light emission layer of an organic EL element.

It is also clear that when a pendant including a functional group, for example, a carbazolyl pendant exhibiting a hole transport property, is attached to PO-1 or PO-2, the properties of these polymers are notably improved as shown in the Tables shown in the present Specification or in the 1.132 declaration submitted on November 24, 2009 or submitted together with the present response.

In the following, the properties of polymers which have, one or more substituents or an additional divalent group incorporated in the main chain of Poly-13, in addition to the polymer chain of Poly-13, are compared with the properties of Poly-13, when these polymers were used in the light emission layer of an organic EL element.

In the following discussion:

Tables 5 and 7 are in pages 106-107 of the present Specification;

Table 5-continued and Table 7-continued, Tables 9 - 12 are in the 1.132 declaration submitted on November 24, 2009; and

With respect to additional data, Table 5-continued-2 and Table 7-continued-2 are in the 1.132 declaration submitted together with the present response.

(1) Organic EL element 2-1-7 in Tables 5 and 7 shows the properties of Poly-13, namely, External quantum efficiency of 120, Emission Life of 168, and Driving voltage of 91.

Here, in Table 5, the column of "Light emission layer" of Organic EL element 2-7-1 was amended to be "poly-13/Ir-1" in the response filed on November 24, 2009.

(2) Organic EL element 2-1-2 in Tables 5 and 7 shows the properties of Poly-12 having a methyl group substituted for hydrogen in Poly-13 as a substituent. Organic EL element 2-1-2 shows "External quantum efficiency" of 152, "Emission Life" of 341, and "Driving voltage" of 91, exhibiting a notably higher External quantum efficiency, a notably longer Emission Life and

almost comparable Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(3) Organic EL element 2-1-22 in Table 5-continued-2 and Table 7-continued-2 shows the properties of Poly-16 also having a methyl group substituted for hydrogen in Poly-13 as a substituent. Organic EL element 2-1-22 shows "External quantum efficiency" of 151, "Emission Life" of 293, and "Driving voltage" of 91, exhibiting notably higher External quantum efficiency, notably longer Emission Life and almost comparable Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(4) Organic EL element 2-1-21 in Table 5-continued-2 and Table 7-continued-2 shows the properties of Poly-17 having an iso-octoxy group substituted for hydrogen in Poly-13 as a substituent. Organic EL element 2-1-21 shows "External quantum efficiency" of 123, "Emission Life" of 181, and "Driving voltage" of 92, exhibiting a higher External quantum efficiency, a notably longer Emission Life and almost comparable Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(5) Organic EL element 2-1-5 in Tables 5 and 7 shows the properties of Poly-19 having a phenylene group substituted for hydrogen in Poly-13 as a substituent. Organic EL element 2-1-5 shows "External quantum efficiency" of 136, "Emission Life" of 720, and "Driving voltage" of 72, exhibiting a higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(6) Organic EL element 2-1-9 in Tables 5 and 7 shows the properties of Poly-28 having an additional phenylene group in the main chain of Poly-13. Organic EL element 2-1-9 shows "External quantum efficiency" of 176, "Emission Life" of 621, and "Driving voltage" of 74, exhibiting a higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(7) Organic EL element 2-1-12 in Tables 5 and 7 shows the properties of PO-8 having an phenylene group substituted for hydrogen in Poly-13 as a substituent and a phenylcarbazolyl group substituted for the carbazolyl group of Poly-13. Organic EL

element 2-1-12 shows "External quantum efficiency" of 250, "Emission Life" of 711, and "Driving voltage" of 75, exhibiting a notably higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(8) Organic EL element 2-1-24 in Table 5-continued-2 and Table 7-continued-2 shows the properties of PO-9 having a 2-pyridyl group substituted for hydrogen in Poly-13 as a substituent and a phenylcarbazolyl group substituted for the carbazolyl group of Poly-13. Organic EL element 2-1-24 shows "External quantum efficiency" of 242, "Emission Life" of 590, and "Driving voltage" of 71, exhibiting a notably higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(9) Organic EL element 2-1-25 in Table 5-continued-2 and Table 7-continued-2 shows the properties of PO-10 having a 3-pyridyl group substituted for hydrogen in Poly-13 as a substituent and a phenylcarbazolyl group substituted for the carbazolyl group of Poly-13. Organic EL element 2-1-25 shows

"External quantum efficiency" of 251, "Emission Life" of 614, and "Driving voltage" of 73, exhibiting a notably higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(10) Organic EL element 2-1-14 in Table 5-continued and Table 7-continued in the 1.132 declaration submitted on November 24, 2009 shows the properties of PO-11 having a phenyl carbazolyl group substituted for hydrogen in Poly-13 as a substituent. Organic EL element 2-1-24 shows "External quantum efficiency" of 231, "Emission Life" of 662, and "Driving voltage" of 76, exhibiting a notably higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(11) Organic EL element 2-1-15 in Table 5-continued and Table 7-continued shows the properties of PO-12 having a phenylcarbazolyl group substituted for hydrogen in Poly-13 as a substituent and a phenylcarbazolyl group substituted for the carbazolyl group of Poly-13. Organic EL element 2-1-15 shows "External quantum efficiency" of 238, "Emission Life" of 901, and

"Driving voltage" of 79, exhibiting a notably higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(12) Organic EL element 2-1-17 in Table 5-continued and Table 7-continued shows the properties of PO-13 having a phenylene group substituted for hydrogen in Poly-13 as a substituent and a phenylcarbolinyl group substituted for the carbazolyl group of Poly-13. Organic EL element 2-1-17 shows "External quantum efficiency" of 234, "Emission Life" of 780, and "Driving voltage" of 75, exhibiting a notably higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

(13) Organic EL element 2-1-26 in Table 5-continued-2 and Table 7-continued-2 shows the properties of PO-14 having a phenylene group substituted for hydrogen in Poly-13 as a substituent and a phenyldiazacarbazolyl group substituted for the carbazolyl group of Poly-13. Organic EL element 2-1-25 shows "External quantum efficiency" of 251, "Emission Life" of 614, and

"Driving voltage" of 73, exhibiting a notably higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13.

From above (1) - (13), it is clear that any of the Organic EL elements listed in above Items (2) - (13) show more favorable properties as an Organic EL element than the properties of Organic EL element 2-1-7 of above Item (1) employing Poly-13 in the light emission layer.

The evidence supports that one would reasonably conclude that any kind of substituent or additional divalent group incorporated in the main chain of Poly-13 improves the property of the polymer when used in the light emission layer of an Organic EL element.

Thus, patentability of "Ar_2 represents a phenylene group which may have a substituent or a biphenylene group" which may have a substituent as claimed in amended Claim 3 is supported by the above discussion.

Also, since any kind of substituent of Poly-13 can improve the property of an Organic EL element as discussed above, the

following description for Formula (3) in amended Claim 3: "wherein R_{14} - R_{21} each independently represent a hydrogen atom, an alkyl group or a cycloalkyl group, provided that adjacent groups of R_{14} - R_{21} may be joined to form a ring" is also supported.

Further, each of Organic EL elements 2-1-17 in Table 5-continued and Table 7-continued in the 1.132 declaration submitted on Novenber 24, 2009 employing PO-13 and Organic EL element 2-1-26 in Table 5-continued-2 and Table 7-continued-2 in the 1.132 declaration submitted with the present response employing PO-14 shows a notably higher External quantum efficiency, a notably longer Emission Life and a notably lower Driving voltage when compared with Organic EL element 2-1-7 employing Poly-13, as described in above Items (12) and (13).

Accordingly, patentability of the description for Formula (9) in amended Claim 3: "wherein Z_1 and Z_2 each represent a 6-membered aromatic ring comprising a group of atoms selected from the group of carbon, hydrogen and nitrogen, provided that Z_1 and Z_2 may be different" is supported.

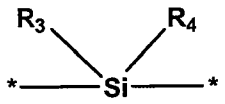
Therefore, amended claim 3 is shown to provide results not expected from the art.

Claim 1 is rejected under 35 U.S.C. 102(a) as being anticipated by Kita et al. (JP 2004-185967 A).

Claim 1 was amended as above.

In the amended Claim 1, the description of "Ar_1 represents a phenylene group which may have a substituent or a biphenylene group" which may have a substituent is supported by the above discussion made for amended Claim 3.

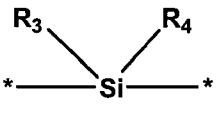
A polymer chain including:



has not been disclosed by any combination of Kita et al. (JP 2004-185967 A) and Takimoto et al. (US 5,331,182 A).

When Organic EL element 2-1-3 employing Poly-17 in the light emission layer and Organic EL element 2-1-7 employing Poly-13 in the light emission layer (both elements are shown in Tables 5 and 7 in page 106-107 of the Specification) are compared, Organic EL element 2-1-3 exhibits a notably higher External quantum

efficiency, a notably longer Emission Life and a notably lower Driving voltage than those of Organic EL element 2-1-7.

Accordingly, the polymer represented by Formula (1) of amended Claim (1), including  as linkage group L_1 is evidenced to be unexpectedly superior to the polyphenylether polymer.

Therefore, amended Claim 1 is not anticipated by or obvious over Kita et al. or Takimoto et al.

Thus, amended Claim 1 is not shown or suggested by the cited art.

According to the same discussion as above, amended Claims 9 and 10 should be allowed.

According to the same discussion as above, specifically, above Item (10) for PO-11 and Item (11) for PO-12, Claims 29 and 30 should be allowed.

Claim 31 is indicated to be allowed if rewritten in the independent form including all of the limitations of the base claim and any intervening claims.

Therefore, Claim 28 should also be allowed.

Since Claims 11-14 are dependent upon Claim 1, Claims 15-18 are dependent upon Claim 3, Claims 19-22 are dependent upon Claim 9, and Claims 13-16 are dependent upon Claim 10, these claims should also be allowed.

In view of the above, the rejections are avoided. Allowance of the application is therefore respectfully requested.

Respectfully submitted,

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Encs. Petition for Two Month Extension of Time and Fee
Declaration Under 37 CFR 1.132